

Here is just the factual sort of material that all in public health need to reassure timid or doubtful people who may be influenced by the baseless charges about the dangers of fluoridation shouted at public meetings, or set forth in letters to the editor. Each point made in this progress report should be indelibly planted in the minds of those of us who meet the public.

Newburgh-Kingston Caries Fluorine Study

V. Pediatric Aspects—Continuation Report

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THE Newburgh-Kingston Caries Fluorine Study was initiated with a dual objective: (1) to determine, under controlled conditions, the extent of inhibition of dental caries through the introduction of sodium fluoride in the drinking water, and (2) to study possible systemic effects of fluoridated drinking water by careful longitudinal study of groups of children. In both aspects of the study, comparisons have been made between the findings in the City of Newburgh, in which fluoridation of the drinking water supply was started on May 2, 1945, and the City of Kingston, in which the water supply has remained essentially fluoride-free. A number of reports¹⁻³ have appeared on the dental findings in the study which have indicated a steadily diminishing incidence of dental caries in the City of Newburgh, as contrasted with no significant change in the incidence of dental caries in the control City of Kingston.

A preliminary report of the pediatric aspects of the Newburgh-Kingston study, published in 1950,⁴ explained the various factors investigated and the methods of study. The report included

the findings in the pediatric examinations, laboratory tests, x-rays, and ophthalmological and otological examinations. The examinations reported upon at that time failed to disclose significant deviations in any of the factors studied in groups of children ingesting drinking water containing 1.2 ppm of fluoride ion as compared with the control group.

Since the appearance of this preliminary report, fluoridation of drinking water supplies has become an accepted public health procedure. Leading national professional organizations and official and voluntary health agencies have urged universal application of this procedure wherever potable water supplies can be fluoridated under adequately controlled conditions.⁵ As one manifestation of this increased nationwide interest, many inquiries have been received by the New York State Department of Health about the current status of the pediatric aspects of the Newburgh-Kingston study. In view of this interest, a progress report on those aspects of the study not specifically related to dental caries appears warranted.

METHODS OF STUDY

The methods of study described in the preliminary report have been continued without essential change. From 1944 to 1949, 1,602 children were brought under periodic pediatric appraisal: 891 in Newburgh and 711 in Kingston. Of this group, 1,096 children have been followed to the time of the present report. No additional children have been brought into the study since 1949 because a sufficient period of follow-up would not be possible prior to the end of the study period.

Except for the special ophthalmological and otological examinations of a small group of children, statistical analyses of the results of the examinations are available for the period up to 6 years after the introduction of fluoride and will be presented in this report. There was a group of children in Newburgh for which there was no comparable age group in the control city, Kingston, and these children have been eliminated from this analysis. The current report is based on the 573 children remaining in the study in Newburgh, and on the 482 children who have been studied in the control group in Kingston. These children range in age from 31 to 174 months, or from 3 years through 14 years to the nearest birthday. In each city there was a larger proportion of males than females.

FINDINGS

Comparison of the findings of the medical examination of children in the 2 cities immediately before the introduction of fluoride into the Newburgh drinking water supply with the results of similar examination 6 years afterward failed to disclose any pathological deviations in any of the factors studied. The clinical impression of the pediatrician in charge of the pediatric research aspects of the study is that there is no difference in the physical appearance of the 2 groups of children and no clinical

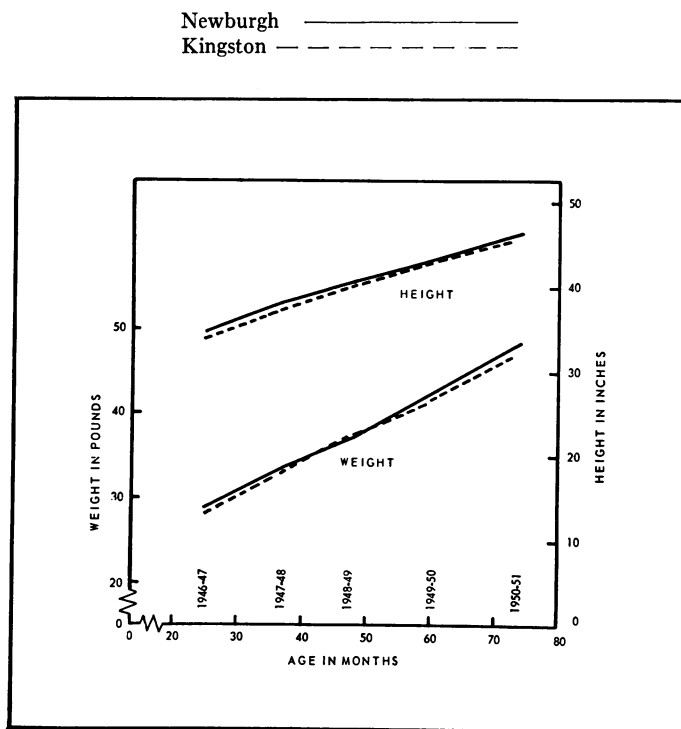
evidence or suspicion of any toxic effects in the Newburgh group 7 years after fluoridation of the Newburgh drinking water supply.

Continued special emphasis has been placed upon the examination of tissues and organs which may possibly be affected by larger amounts of fluoride than those taken in water fluoridated at the level of the Newburgh supply. A comparison of groups of children in the 2 cities at the time of the 1950-1951 medical examinations, an average of 5 years and 9 months after fluoridation was instituted, failed to disclose pathological changes. No differences could be observed, for example, in the oiliness or dryness of the skin, or in skin turgor, nor was there any evidence of thyroid enlargement in the preadolescent group in Newburgh as compared with Kingston.

A significantly higher proportion of tonsillectomies is performed among children in Newburgh when compared to similar age groups in Kingston, but this was true before fluoridation began and reflects medical practice in the two communities. Among the boys in Newburgh, a slightly higher proportion of children with fingernails with leuconychia or occasional small white spots were observed, but this does not appear to have any pathological significance. Other than these, there are apparently no observable differences in the findings on medical examination of the groups of children in the 2 cities.

With a longer period of observation since the preliminary report, it is now possible to carry out more detailed analysis of the changes in height and weight in the 2 groups studied. Since the fall of 1946, pediatric examinations have been performed at annual intervals. By grouping the children by age to the nearest birthday and plotting the average weight or height against the average age of each group in succeeding examinations, any generalized accelera-

FIGURE 1—Average Height and Weight at Successive Examinations of Boys Ages 19–30 Months in 1946–1947 Examinations



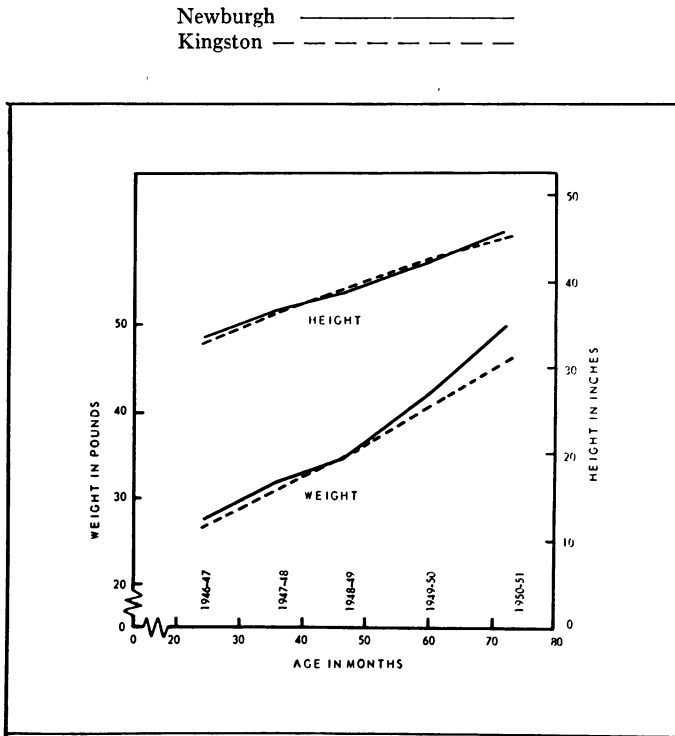
tion or retardation in growth in the Newburgh children would be revealed by divergent trends. As a whole, the graphs do not demonstrate any such consistent pattern. The trends, for Newburgh and Kingston children, whether parallel or superimposed, do not differ significantly in their slopes.

Figures 1 and 2 represent the average height and weight at subsequent examinations of boys and girls who were 19 through 30 months of age in the 1946–1947 series. This age group was chosen for graphic presentation because the rapid rate of growth during the age period covered would presumably reflect any possible effect of fluoridated water on growth. Figure 1 depicts the increase in height and weight of boys during the period studied. It is presented as characteristic of all the age-sex groups, except for the group shown in Figure 2. The apparent sharp increase

in weight of the Newburgh girls in Figure 2 is due to the weight of one child who is very much overweight. A review of her pediatric records discloses that this child and her brother are unusually heavy for their age and height. Their father is also markedly overweight. Since the number of children at any one age level is small, one extreme measurement can influence the average unduly. It is apparent, nevertheless, that the rate of increase in height and weight of the children drinking fluoridated water has not been altered as compared with those drinking fluoride-free water.

Since osteosclerosis has been reported in individuals who have received known toxic doses of fluoride over long periods of time, careful attention has been paid to the interpretation of roentgen films. X-rays are taken of the right hand and both knees of each child at annual in-

FIGURE 2—Average Height and Weight at Successive Examinations of Girls Ages 19–30 Months in 1946–1947 Examinations



tervals in both cities. Dr. John Caffey, professor of clinical pediatrics at the College of Physicians and Surgeons, Columbia University, has continued to review the films without resort to the clinical records of the children or knowledge of the city in which the children reside. He has found no detectable difference in bone density in the children in the 2 cities studied. All but a very small group of children in both cities have been found by Dr. Caffey to be within the normal range of skeletal maturation on clinical estimation. There were 5 children in Newburgh and 8 children in Kingston in whom the question of delayed bone maturation arose. These children are being followed further, but there appears to be little difference between the groups in the two cities in this respect.

As indicated in our previous report,

routine urine analysis, hemoglobin, total leukocyte count, and total erythrocyte count are performed each year on a rotating schedule on one-third of the children in Newburgh. The laboratory examinations were suspended in Kingston during 1947, since an adequate baseline for these observations had been established. Minor urinary changes were found in only 2 children in the City of Newburgh, and hemoglobin determinations toward the lower limit of the normal range were observed in only a very few children. These results are well within the limits of what is to be expected in a presumably normal population.

Special examinations of the eyes and ears of a selected group of children who have resided in Newburgh since the introduction of fluoridated water were repeated in 1949, 4 years after the intro-

duction of fluoride into the drinking water. Of 24 children tested both in 1945 and 1949, 3 had some degree of impairment of visual acuity in 1945. None of these showed progression in the extent of impairment of visual acuity in the intervening 4 years. Of the remaining 21 children, all but 4 could read the 20 over 20 line or better on the Snellen Test Chart in 1949. A different group of children was tested in 1952: 22 of the 25 could read the 20 over 20 line or better. Two showed moderate myopia and one showed a unilateral amblyopia and hyperopia of the opposite eye. These findings are well within expected limits of deviation of any group of children.⁶ Special studies were made of the visual fields of the group whose visual acuity was tested in 1952. These showed that all but one had visual fields within generally accepted normal limits. The only child about whom there was any question was the one with moderate myopia who did not bring her glasses at the time of examination, so that an adequate examination could not be performed. Follow-up to have her repeat the examination was unsuccessful. The ophthalmologist also measured the blind spots of the children and found them to compare favorably with previously reported measurements of the normal range in children.

In 1952 a group of 25 children was given careful otological examinations, including audiometric tests, using a pure-tone diagnostic audiometer. In this group of children, all but 2 fell within the frequencies of normal speech range with deviations no greater than 8 per cent from the baseline. Of the 2 children having a greater loss in one or both ears, one was found to have otitis media and swollen Eustachian eminences at the time of examination, and the other had had recent otitis media. In any case, the findings in rela-

tion to hearing were well within the limits of expected variation in the group of children of the age examined.⁷

SUMMARY AND CONCLUSIONS

1. The findings on the pediatric examinations of the children studied in Newburgh and Kingston over a period of 6 years since introduction of fluoride in the Newburgh water supply are reported.

2. Physical examinations, including measurements of height and weight, selected laboratory tests, and roentgen studies, fail to disclose any significant deviations in any of the factors studied in the group of children ingesting fluoridated water as compared with the control group.

3. While the pediatric aspects of the Newburgh-Kingston caries fluorine study will be continued for the full 10 years of the total study to obtain the data originally sought, there is no reason to anticipate any systemic effects from fluoridated drinking water.

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